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Comparison of Rain Gauges in Los Angeles.

BY SERGEANT GEORGE E. FRANKLIN.

[Read June 4, 1888.]

TO THE HISTORICAL SOCIETY OF SOUTHERN CALIFORNIA — LADIES AND GENTLEMEN: Referring to a recent visit of your committee to this office, and conversation upon the subject of the rainfall for the past season, and the doubt cast upon the accuracy of the signal service record, I beg leave to address you upon the subject.

The impression entertained by many persons that a defect exists either in the exposure or the construction of the signal service gauge, is not borne out by the facts in the case, as will be shown presently by a comparative statement of the rainfall for the past season as recorded by a number of observers in this locality, and while this data is not as comprehensive as I desire, it will answer the purpose sufficiently to refute the idea of inaccuracy of the signal service record. Another impression that has general credence, through the popular reliance on the recollection of past occurrences, instead of actual facts, is that more than the average number of rainy days occurred with an attendant large rainfall. This impression will also be shown to be erroneous, by a table compiled for a period of ten years from the signal service records, giving the number of days rain fell each season, the seasonal rainfall and averages.

An examination of the following statement of the rainfall in this vicinity, as recorded by a number of observers, will show that the signal service record is not defective, nor that more than the usual amount of rain has fallen, except in the case of Mr. Ducommun's gauge, which records a precipitation greatly in excess of any of the others.

RAINFALL, SEASON OF 1887–8.

ignal Service Record.	Record at M. VanNuy's ranch San Fernando.	Record at the Raymond Hotel, Pasadena.	S. P. R. R. Co.'s Record.	Mr. Ducommun's Record.
13.96	13.13	16.95	18.96	26.38

It will be observed from the above table that the record of all the observers, excepting Mr. Ducommun, have a certain correspondence, and show neither an excess nor deficiency greater than is to be expected from the location of the gauges.

The table below will show that the facts do not support the impression that more than the average number of rainy days occurred, or that the rainfall was unusually heavy, but on the contrary, the past season was deficient both in the number of days on which rain fell and the amount of rainfall, as will be observed by comparing the season with the averages.

NUMBER OF DAYS RAIN FELL EACH SEASON, AND SEASONAL RAINFALL.

Season.......	1878-9	1879-80	1880-1	1881-2	1882-3	1883-4	1884-5	1885-6	1886-7	1887-8
No. of days rain fell,	35	49	35	37	34	64	27	38	30	37
Rainfall, inches.....	11.35	20.34	13.13	10.40	12.11	38.22	9.25	22.58	13.76	13.96

Average number of days rain fell 38.6

Average seasonal rainfall.......................................16.51 inches.

The rains, with the exception of those falling during the latter part of December and the first portion of Janury, were comparatively light and beneficial, the water being absorbed by the dry earth and not running off in torrents as is usual when heavy rainfall occurs. The difference between the gauge of this station and others in this vicinity, is due no doubt largely to the exposure, being affected by wind currents and the topographical features of the country; this difference is not more than is to be anticipated, as I mentioned before, except in the case of Mr. Ducommon's gauge. There are several causes that seem to account for this difference, but are not entirely satisfactory in explaining why so great a difference should exist in so limited an area.

It is probable that the topographical features of the section of the city where Mr. Ducommon has his gauge exposed, have an important influence in giving an increased precipitation, as the high hills on either side of the city, sloping to the river, form a trough through which the rain currents, in passing, are contracted and made more dense than in the open country, tending to give an increased precipitation; and also that here the wind is less liable to currents and eddies. Another factor in explaining this difference, may be that the amount of water collected by the signal service gauge is affected by the rain currents impinging upon the sides of the tower on which the gauge is located, producing a deflection that affects the amount of water received by the collector.

Admitting this to be a fact, the difference should not be so material as is noted between the gauges, amounting this season to nearly one hundred per cent. Another cause may be a difference in the reading of the gauges, which can only be determined by a careful comparison of the instruments. It seems scarcely possible that nearly twice as much rain should fall in a radius of less than one-fourth of a mile under nearly similar circumstances, and in order to determine whether this increased precipitation is due to natural causes or other effects, I desire to locate a standard gauge in that vicinity to ascertain if similar results will occur. I also desire to locate gauges at several other points in the city, and would be pleased to have your co-operation and that of the members of the Historical Society who feel an interest in the matter.

I desire to give you a description of the gauge adopted as the standard instrument of the Signal Service, and the location to select for exposing gauges in order to obtain the best results. The signal service gauge consists of three parts, the collector, a funnel-shaped receptacle 8 inches in diameter at the top, fitting into a brass receiver of uniform calibre, 2.53 inches in diameter and 20 inches deep; these parts securely fit an overflow by a collar attached to the collector; the overflow vessel is to receive the surplus water when the receiver has become filled during heavy rains. The amount of rainfall is measured by inserting vertically into the receiver a graduated rod until it touches the bottom, where it is allowed to remain a moment and then withdrawn, the number of inches or fractions of an inch the water has wetted being recorded. The sectional areas of the receiver and collector are as one to ten, the depth of water being ten times as much as should be recorded; hence ten inches of water in the receiver are equal to one inch of rainfall and one inch of water to one-tenth of rainfall.

The best exposure for a gauge is upon reasonably level ground, with its supports so arranged that the instrument will be vertical, with the top of the collector in the same horizontal plane and 12 inches above the ground. The location selected should be at such a distance from neighboring objects that their tops will not have an angle of more than 45° elevation above the gauge, and should be protected from interference by unauthorized persons or animals.

A ground exposure is the best from the fact that elevated gauges are more or less subjected to wind currents and eddies, and these influences have a minimum effect at the earth's surface. It is not always practicable to locate gauges upon the ground, as in closely built cities, where of necessity they must be exposed upon the roofs of buildings, as free as possible from extraneous circumstances that would impair the accuracy of the record. As rainfall is not a constant quantity, varying with locality and causes that produce precipitation of the vapor of the atmosphere, a gauge measures only the amount of water that falls into it, and is analagous to a barometer which measures the weight of a column of air immediately above it, from which we infer that the neighboring columns of air are similarly affected, and conclude it furnishes an average for the vicinity.